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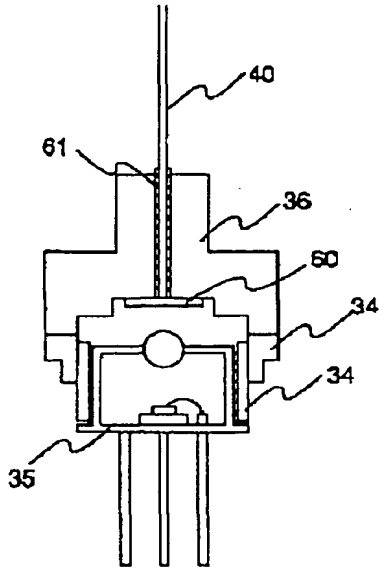
(54) OPTICAL TRANSMITTER-RECEIVER

(57) Abstract:

PURPOSE: To provide an optical transmitter-receiver which can constitute an optical coupling part with a row cost without requiring the practical grinding work of the end face of an optical fiber.

CONSTITUTION: With respect to the optical transmitter-receiver provided with an optical coupling system consisting of a light emitting or receiving element 35, an optical fiber 40, and a holder 36 supporting the optical fiber 40, the holder 36 is provided with an insertion hole for the optical fiber 40 and a transparent window 60 which closes the insertion hole, and the end face of the optical fiber 40 inserted to this insertion hole is butted to the transparent window 60, and the junction part between the transparent window 60 and the end face of the optical fiber is fixed by adhesion with a transparent material 61. Since the end face or the optical fiber 40 constituting the optical coupling system is adhered and fixed to the transparent window 60 with the transparent material 61 between them without gaps, recessed parts are filled with the transparent resin 61 even if the end face of the optical fiber 40 is somewhat rugged, and as the result, the loas due to light scattering or the like is prevented.



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Bibliography

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Epitome

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(57) [Abstract]
[Objects of the Invention] Offer the optical transceiver machine which can constitute an optical bond part from low cost, without needing the substantial polish activity to an optical fiber end face.
[Elements of the Invention] In the optical transceiver machine equipped with the optical coupled systems which consist of holders for supporting a light emitting device or a photo detector, an optical fiber, and an optical fiber Prepare the transparence aperture which plugs up the insertion hole and its insertion hole of an optical fiber to a holder, and the end face of the optical fiber inserted in the insertion hole concerned is compared in the transparence aperture. Since adhesion immobilization of the end face of the optical fiber which carried out adhesion immobilization of the comparison part of a transparence aperture and an optical fiber end face by the transparent matter, and constituted the optical combined system is carried out through the transparent matter that there is no clearance in a transparence aperture Even if a little irregularity is in the end face of an optical fiber, the part is filled up with transparent resin, as a result loss by dispersion of light etc. can be prevented.

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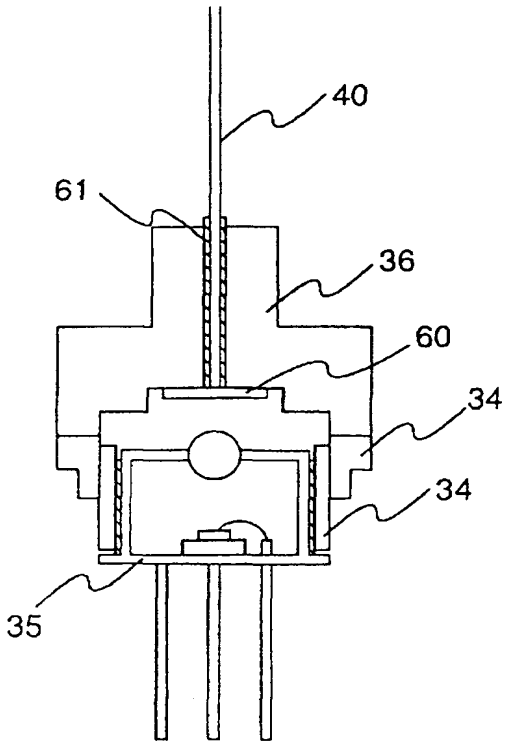

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CLAIMS

[Claim(s)]
[Claim 1] In the optical transceiver machine equipped with the optical coupled systems which consist of holders for supporting a light emitting device or a photo detector, an optical fiber, and an optical fiber The optical transceiver machine characterized by having prepared the transparence aperture which plugs up the insertion hole and its insertion hole of an optical fiber to a holder, having compared the end face of the optical fiber inserted in the insertion hole concerned in the transparence aperture, having carried out adhesion immobilization of the comparison part of a transparence aperture and an optical fiber end

face by the transparent matter, and constituting optical coupled systems.
[Claim 2] A transparence aperture is an optical transceiver machine according to claim 1 which consists of a plate of the transparent quality of the material.
[Claim 3] In the optical transceiver machine equipped with the optical coupled systems which consist of holders for supporting a light emitting device or a photo detector, an optical fiber, and an optical fiber a holder It is formed with the transparent ingredient and the transparence aperture which plugs up the insertion hole and its insertion hole of an optical fiber is held. The optical transceiver machine characterized by having compared the end face of the optical fiber inserted in the insertion hole concerned in the transparence aperture, having carried out adhesion immobilization of the comparison part of a transparence aperture and an optical fiber end face by the transparent matter, and constituting optical coupled systems.
[Claim 4] A transparence aperture is the holder of a transparent ingredient, and an optical transceiver machine according to claim 3 formed in one. [Claim 5] A transparence aperture is an optical transceiver machine according to claim 3 which is a convex lens-like.
[Claim 6] In the optical transceiver machine equipped with the optical coupled systems which consist of holders for supporting a light emitting device or a photo detector, an optical fiber, and an optical fiber The resin impregnation hole which reaches the transparence aperture which plugs up the insertion hole and its insertion hole of an optical fiber to a holder, and its transparence aperture is prepared. The optical transceiver machine characterized by having compared the end face of the optical fiber inserted in the insertion hole concerned in the transparence aperture, having carried out adhesion immobilization by the transparent matter into which the comparison part of a transparence aperture and an optical fiber end face was poured from the resin impregnation hole, and constituting optical coupled systems.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the optical transceiver machine in the communication system which used the optical fiber as the transmission medium.

[0002]

[Description of the Prior Art] The example of 1 configuration of an optical transceiver machine is shown in drawing 4 . A light-emitting part 20, a light sensing portion 30, and the transceiver circuit board 50 are stored in a case 10, and it consists of pigtail structure which pulls out an optical fiber 40 directly from a light-emitting part 20 and a light sensing portion 30. In order to exchange a signal with other circuits, from the circuit board 50, the lead pin 51 penetrates a case 10 and is pulled out outside. The optical transceiver machine of the above configurations is used widely now. The above component part is put into another case by the transmitting side and the receiving side, and there is also an example of a configuration used as the optical transmitter and the optical receiver, respectively.

[0003] The example of a configuration of the light sensing portion of the conventional optical transceiver machine is shown in drawing 5 . Adhesion immobilization of the optical fiber 40 is carried out with adhesives at the metallic capillary 41, the end face of an optical fiber 40, i.e., the outgoing radiation edge of light, is ground with a capillary 41, and it is made into the smooth condition. A capillary 41 is inserted in the insertion hole of the metal holder 31, and is being fixed by welding. Adhesion immobilization of the photo detector 35 with the configuration which closed the photo detector body with a package with a lens is carried out by resin 33 at the adapter 32, and the adapter 32 is welded to the holder 31. Welding of a capillary 41 and an adapter 32 is performed in the condition of having moved and aligned the capillary 41 and the adapter 32 to the holder 31 so that the optical coupling of an optical fiber 40 and a photo detector 35 can be taken.

[0004] The above-mentioned configuration is completely the same also in a light-emitting part. If a light emitting device is aligned and fixed instead of a photo detector 35, it will become a light-emitting part.

[0005] The conventional method is a general method which combines an optical fiber and a light emitting device, and since it grinds the end face of an optical fiber, plane of incidence will be in a smooth condition, and it can take optical coupling certainly.

[0006]

[Problem(s) to be Solved by the Invention] According to the configuration of drawing 5 , there was a fault that the cost which an assembly takes became high. Incidentally, before fixing each part article to a holder, it is necessary to fix an optical fiber to a capillary beforehand. And resin is attached to an optical fiber, first, it inserts until it overflows the opposite side of insertion opening of a capillary, and resin is stiffened in this condition. Next, the extra length of an optical fiber is cut and an end face (outgoing radiation edge) is ground further the whole capillary. Another ******** need is in several times until polish of this end face will be in a mirror plane condition. Since the number of the capillaries which

can grind at once is [several], the floor to floor time which per capillary takes is long. Moreover, since very highly precise processing is required, the yield cannot necessarily be improved.

[0007] Then, the purpose of this invention is to offer the optical transceiver machine which can constitute an optical bond part from low cost, without needing the substantial polish activity to an optical fiber end face.

[0008]

[Means for Solving the Problem] The first means of this invention offered in order to attain the above-mentioned purpose In the optical transceiver machine equipped with the optical coupled systems which consist of holders for supporting a light emitting device or a photo detector, an optical fiber, and an optical fiber The transparence aperture which plugs up the insertion hole and its insertion hole of an optical fiber to a holder is prepared, the end face of the optical fiber inserted in the insertion hole concerned is compared in the transparence aperture, and it is in the optical transceiver machine characterized by having carried out adhesion immobilization of the comparison part of a transparence aperture and an optical fiber end face by the transparent matter, and constituting optical coupled systems. According to this means, since adhesion immobilization of the end face of an optical fiber is carried out through the transparent matter that there is no clearance in a transparence aperture, even if a little irregularity is in the end face of an optical fiber, the part is filled up with transparent resin, as a result loss by dispersion of light etc. can be prevented. Therefore, even if the end face of an optical fiber is cut without grinding, it does not cause inconvenience at all. In this means, a transparence aperture is good to consist of a plate of the transparent quality of the material.

[0009] Moreover, the second means of this invention offered in order to attain the above-mentioned purpose In the optical transceiver machine equipped with the optical coupled systems which consist of holders for supporting a light emitting device or a photo detector, an optical fiber, and an optical fiber a holder It is formed with the transparent ingredient and the transparence aperture which plugs up the insertion hole and its insertion hole of an optical fiber is held. The end face of the optical fiber inserted in the insertion hole concerned is compared in the transparence aperture, and it is in the optical transceiver machine characterized by having carried out adhesion immobilization of the comparison part of a transparence aperture and an optical fiber end face by the transparent matter, and constituting optical coupled systems. According to this means, the resin for carrying out adhesion immobilization of resin and the photo detector which carry out adhesion immobilization of the optical fiber at a holder at a holder can be used as ultraviolet curing mold resin by a holder being formed with the polish needlessness of the optical fiber end face by the first means, transparent ingredient, for example, plastic material, and quick hardening and immobilization of the resin by UV irradiation are attained. In this means, a transparence aperture is good to consist of a plate of the transparent quality of the material, or to be formed in the holder of a transparent ingredient, and one. Furthermore, a

transparence aperture can also make a lens unnecessary by considering as the shape of a convex lens at a photo detector side.

[0010] Furthermore, the third means of this invention offered in order to attain the above-mentioned purpose In the optical transceiver machine equipped with the optical coupled systems which consist of holders for supporting a light emitting device or a photo detector, an optical fiber, and an optical fiber The resin impregnation hole which reaches the transparence aperture which plugs up the insertion hole and its insertion hole of an optical fiber to a holder, and its transparence aperture is prepared. The end face of the optical fiber inserted in the insertion hole concerned is compared in the transparence aperture, and it is in the optical transceiver machine characterized by having carried out adhesion immobilization by the transparent matter into which the comparison part of a transparence aperture and an optical fiber end face was poured from the resin impregnation hole, and constituting optical coupled systems. According to this means, resin can be easily poured in to the back of an optical fiber insertion hole through a resin impregnation hole with the polish needlessness of the optical fiber end face by the first means, and adhesion without the clearance between an optical fiber end face and a transparence aperture can be attained certainly more quickly.

[0011]

[Example] Drawing 1 is the example of the first means of this invention, and makes an optical receiver an example. the holder of a sign 36 -- metal -- it comes to attach the glass plate 60 which consists of a product made from stainless steel desirably, and serves as a transparence aperture in the form which plugs up internal opening of the insertion hole of the optical fiber which it had in itself.

[0012] Adhesion immobilization of the optical fiber 40 is carried out by transparent resin 61 by the condition of it having been inserted from the insertion hole of a holder 60, and having run against the glass plate 60. The end face of an optical fiber 40, i.e., the outgoing radiation edge of light, is in a condition [being ground and cut]. The amputation stump side of this optical fiber is dashed by the glass plate 60, and adhesion immobilization of the end face and glass plate of an optical fiber is carried out with the transparent resin 61 which applied the clearance between an optical fiber 40 and a holder 36, and entered.

[0013] The photo detector 35 which becomes as structure which confined the photo detector body with a package with a lens minds an adapter 34, and is being aligned and fixed by the holder 36.

[0014] Like this example, since a part for these concave heights is filled up with transparent resin even if the end face of an optical fiber 40, i.e., the outgoing radiation edge of light, contacts a glass plate 60 and some irregularity is in the end face of an optical fiber like a cutting plane, the problem of loss by dispersion of light etc. is lost. the end face of an optical fiber is cut therefore, as -- good -- the cost like mirror plane finishing -- a quantity polish activity is done unnecessary. If there is need, if nonreflective coating is carried out, the effect of the reflection which is easy to pose a problem with the conventional configuration

is also easily solvable to a glass plate 60. In this example, if the refractive index of a transparent resin 61 and a transparent glass plate 60 is brought close to the refractive index of the core of an optical fiber 40, it is more effective.

[0015] The above example is completely realizable similarly about a light-emitting part, although related with a light sensing portion. Although the device which grinds a capillary aslant and avoids a reflective problem was needed with the conventional configuration when using a laser diode for a light emitting device, according to this example, the problem of the reflection concerned is solvable only by making a glass plate slanting.

[0016] Drawing 2 is an example including the second and third means of this invention, and makes an optical receiver an example. Since the sign given to it and the congruous signs are given to the same part as drawing 1 , please also combine and refer to the above-mentioned explanation about drawing 1 .

[0017] In this example, a holder 37 is formed with transparent plastic material, and ultraviolet curing mold resin is used for the resin 61 injected into the part of the hole which inserted the optical fiber 40, and the resin 33 which carries out adhesion immobilization of the photo detector 35. Moreover, the resin impregnation hole 62 which reaches to the glass plate 60 which serves as a transparence aperture from the exterior is established in a holder 37.

[0018] Since the holder 37 is formed by not needing the polish process of an optical fiber end face as well as the example of drawing 1 at all with transparent plastic material natural according to this example By being able to use as ultraviolet curing mold resin the resin 61 which fixes an optical fiber, and the resin 33 which fixes a photo detector, as a result irradiating ultraviolet rays through the transparent holder 37, resin 61, and quick hardening and immobilization of 33 can be performed, and low cost-ization can be promoted further. Moreover, since the resin impregnation hole 62 is formed, resin can be poured in to the back of an optical fiber insertion hole, and working efficiency and the yield can be raised.

[0019] Drawing 3 is other examples including the second and third means of this invention, and makes an optical receiver an example. Since the sign given to it and the congruous signs are given to the same part as drawing 1 and drawing 2 , please also combine and refer to the above-mentioned explanation about drawing 1 and drawing 2 .

[0020] In this example, drawing 2 is changed, it comes to form a holder 38 and the transparence aperture 63 in one with transparent plastic material, and the transparence aperture 63 is made into the shape of a convex lens which upheaved to the photo detector side.

[0021] Like the example of drawing 1 , like the abbreviation of the polish process of an optical fiber end face, and the example of drawing 2 , since speeding up of the adhesion fixed activity of the resin by UV irradiation can be followed upwards and the transparence aperture 63 is formed in a holder 38 and one, according to this example Since an activity which attaches a glass plate became unnecessary and the lens function was given by making the transparence aperture 63 into the shape of a convex lens, photo detector 35'

without a lens can be used, and low cost-ization can be realized more.
[0022] In addition, although the transparence aperture 63 was made into the shape of a convex lens, it does not interfere as plate-like. In that case, it cannot be overemphasized that a photo detector is made to be equipped with a lens.
[0023] In the above drawing 2 and the example of drawing 3 , although considered as the light sensing portion, any configuration is realizable as a light-emitting part only by exchanging a photo detector to a light emitting device.
[0024]
[Effect of the Invention] According to the first means, second means, and third means of this invention which was explained above, the desired end of offering the optical transceiver machine which can constitute an optical bond part from low cost, without needing the substantial polish activity to an optical fiber end face can be attained.
[0025] Moreover, according to the second means of this invention, a transparent holder is led, the resin for adhesion can be quickly hardened and fixed in UV irradiation, or according to the third means of this invention, resin can be soon injected into the the end part of the end face of an optical fiber on a transparence aperture through a resin impregnation hole, low cost-ization can be attained more, and it can contribute to improvement in working efficiency or the yield.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The explanatory view in which cross-section-izing the light sensing portion of an optical transceiver machine, and showing it in the example of the first means of this invention.
[Drawing 2] The explanatory view in which cross-section-izing the light sensing portion of an optical transceiver machine, and showing it in the example including the second and third means of this invention.

[Drawing 3] The explanatory view in which cross-section-izing the light sensing portion of an optical transceiver machine, and showing it in other examples including the second and third means of this invention.
[Drawing 4] The decomposition perspective view showing the example of 1 configuration of an optical transceiver machine.
[Drawing 5] The explanatory view in which cross-section-izing the conventional example of the light sensing portion of an optical transceiver machine, and showing it.
[Description of Notations]
35 35' Photo detector
36 Holder (Metal)
37 Holder (Product made of Transparent Plastic)
38 Holder (Product made of Transparent Plastic, Transparence Aperture One)
40 Optical Fiber
60 Glass Plate (as Transparence Aperture)
61 Transparent Resin (Ultraviolet Curing Mold)
62 Resin Impregnation Hole
63 Transparence Aperture (the Shape of a Convex Lens)

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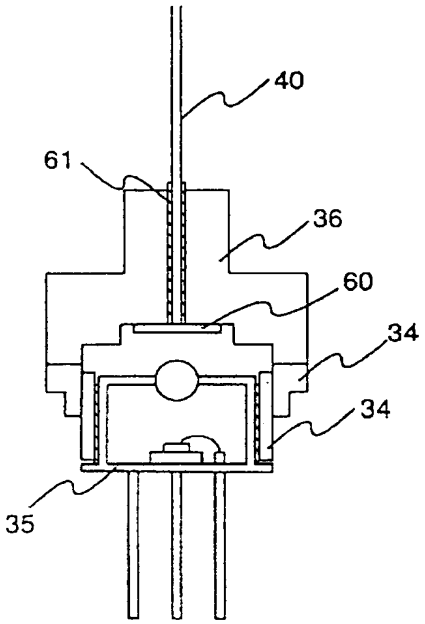
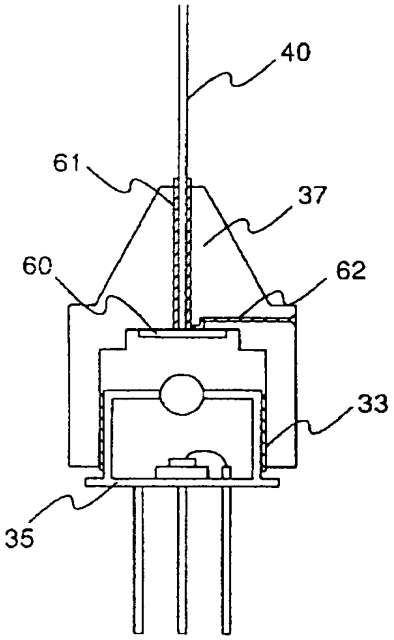
DRAWINGS

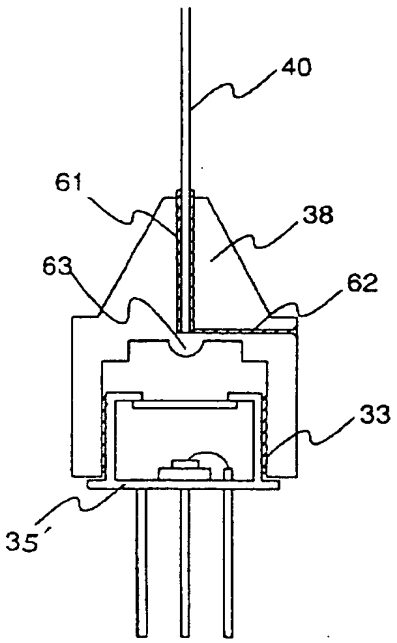
[Drawing 1]



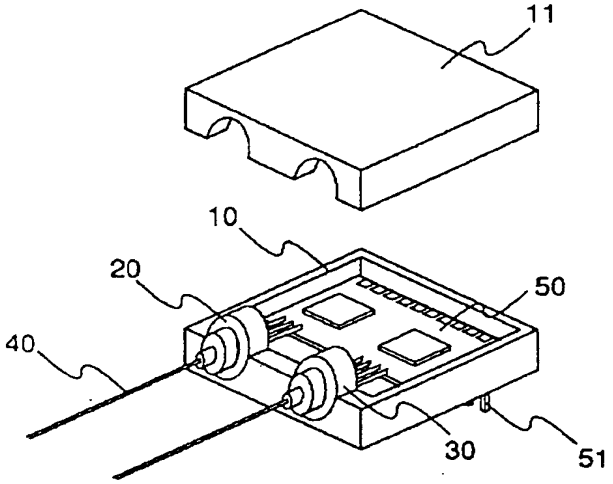
[Drawing 2]



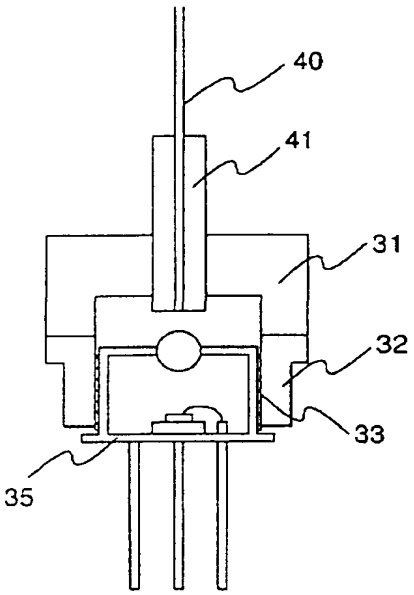
[Drawing 3]



[Drawing 4]



[Drawing 5]



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